

HANDLE SET INCLUDING A SPINDLE ASSEMBLY
CONFIGURED TO RESIST REMOVAL

BACKGROUND OF THE INVENTION

5 **1. Field of the invention.**

 The present invention relates to a handle set, and, more particularly, to a handle set including a spindle assembly configured to resist removal.

2. Description of the related art.

 It is known in the art to have a handle set including a spindle assembly,
10 including a lock mechanism, that is connected to a die cast insert for a knob via a press fit and staking method, wherein a spindle shaft is pressed into the insert and the end tips of the spindle shaft are bent at an angle to resist removal of the spindle shaft from the insert. However, in view of the porosity of the insert material and the angle of the staking, it may be possible to extract the spindle assembly by a pull out force,
15 and as a consequence, the lock mechanism may be disabled.

 What is needed in the art is a spindle assembly having a positive stop that resists pull out and which may provide increased security over prior spindle assembly attachment methods.

20 **SUMMARY OF THE INVENTION**

 The present invention provides a spindle assembly having a positive stop that resists pull out and which may provide increased security over prior spindle assembly attachment methods.

 The invention, in one form thereof, relates to a handle set including a liner
25 body having an insert opening, and a handle assembly having an insert member that is inserted into the insert opening. The insert member has an outer surface, a bore, and a perimetrical groove formed in the outer surface extending around a perimeter of the outer surface. The perimetrical groove extends to the bore at least at one location. A retaining ring is received in the perimetrical groove. A spindle assembly includes a
30 spindle shaft configured for insertion into the bore of the insert member, and a stop member extends outwardly from the spindle shaft. The stop member includes a ramped surface and a stop surface. The spindle shaft is mounted to the insert member by sliding the spindle shaft in a first direction into the bore. The stop member is

configured such that the stop surface engages the retaining ring to resist removal of the spindle shaft from the bore when the spindle shaft is moved in a second direction opposite to the first direction.

5 In another form thereof, the invention relates to a spindle assembly for a handle set. The spindle assembly includes a spindle shaft. A lock mechanism is configured for connection to the spindle shaft. A stop member extends outwardly from the spindle shaft, the stop member including a ramped surface and a stop surface.

10 In still another form thereof, the invention relates to a handle set including a liner body having an insert opening, and a handle assembly having an insert member. The insert member is inserted into the insert opening. The insert member has an outer surface, a bore, and a perimetrical groove formed in the outer surface extending around a perimeter of the outer surface. The perimetrical groove extends to the bore at least at one location. A retaining ring is received in the perimetrical groove. A
15 spindle assembly including a spindle shaft is configured for insertion into the bore of the insert member. The spindle shaft is mounted to the insert member by sliding the spindle shaft in a first direction into the bore. Means is provided for engaging the retaining ring to resist removal of the spindle shaft from the bore when the spindle shaft is moved in a second direction opposite to the first direction.

20 In still another form thereof, the present invention is directed to a method of assembling a handle set, including the steps of providing a liner body having an insert opening; providing a handle assembly having an insert member, the insert member having an outer surface, a bore, and a perimetrical groove formed in the outer surface extending around a perimeter of the outer surface, the perimetrical groove extending
25 to the bore at least at one location; inserting the insert member into the insert opening; mounting a retaining ring in the perimetrical groove; providing a spindle assembly including a spindle shaft, the spindle assembly including a stop member extending outwardly from the spindle shaft, the stop member including a ramped surface and a stop surface; and sliding the spindle shaft in a first direction into the bore, the ramped
30 surface of the stop member engaging the retaining ring to apply an interior force to the retaining ring to expand the retaining ring, the retaining ring returning to a pre-expansion state after the ramped surface passes the retaining ring, the stop surface

engaging the retaining ring to resist removal of the spindle shaft from the bore when the spindle shaft is moved in a second direction opposite to the first direction.

An advantage of the present invention is that spindle assembly resistance to pullback forces is enhanced.

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BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention will be better understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, wherein:

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Fig. 1 is an exploded perspective view of a handle set in accordance with the present invention.

Fig. 2 is a prospective view of the housing of the lock mechanism of Fig. 1.

Fig. 3 is partial sectioned side view of the assembled handle set of Fig. 1.

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Corresponding reference characters indicate corresponding parts throughout the several views. The exemplifications set out herein illustrate an embodiment of the invention, in one form, and such exemplifications are not to be construed as limiting the scope of the invention in any manner.

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DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings and particularly to Fig. 1, there is shown a handle set 10 embodying the present invention.

Handle set 10 includes a liner body 14, a handle assembly 16, a retaining ring 18 and a spindle assembly 20.

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Liner body 14 is configured to serve as a base to which handle assembly 16 and spindle assembly 20 are attached. Liner body 14 includes a pair of threaded mounting members 22 for receiving corresponding fasteners (not shown) when mounting handle set 10 to a door. Liner body 14 has an insert opening 24.

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Handle assembly 16 includes a handle 26, e.g., a knob or lever, and an insert member 28. During assembly, handle 26 is connected to insert member 28, for example, by staking handle 26 to insert member 28. Then, insert member 28 is inserted in the direction indicated by direction arrow 30 through insert opening 24

into an interior region 32 of liner body 14. Handle 26 limits the extent to which insert member 28 can be inserted in direction 30 into liner body 14.

Insert member 28, which may be formed as a cast metal article, has an outer surface 34, a bore 36, and a perimetrical groove 38 formed in outer surface 34 extending around a perimeter 40 of outer surface 34. The term, bore, is used for convenience to reference a generally cylindrical opening, and may include features such as, for example, a passage 42, and other grooves, flats, or protrusions. Passage 42 may be formed as a slot, e.g., a keyway, which extends radially inward from outer surface 34. Bore 36 may be formed using a variety of manufacturing methods, including for example, during the casting and/or machining of insert member 28. Perimetrical groove 38 is configured to extend to bore 36 at least at one location, e.g., at passage 42. Perimetrical groove 38 and passage 42 may be formed, for example, during the casting and/or machining of insert member 28.

Retaining ring 18 is configured as a snap ring to be received in perimetrical groove 38, and includes a split 44. Retaining ring 18 has a pre-expansion state, as shown for example in Figs. 1 and 3, when not acted on by an interior force 46 represented in Fig. 1 by an arrow extending from center line 48. However, retaining ring 18 expands at split 44 when acted on by interior force 46. Retaining ring 18, when installed in perimetrical groove 38, completes the mounting of insert member 28 to liner body 14, and limits the extent to which insert member 28 can be moved in direction 49 with respect to liner body 14. For example, retaining ring 18 contacts liner body 14 to prevent insert member 28 from being pulled through insert opening 24 of liner body 14 in direction 49 by a force exerted at handle 26.

Spindle assembly 20 includes a spindle shaft 50, such as for example, a half-round spindle, a lock mechanism 52, a stop member 54 and limit members 55. Spindle shaft 50 includes a mounting portion 56 configured to slide, e.g., via a pressed insertion, into bore 36 of insert member 28 in direction 49. Lock mechanism 52 is configured to be mounted to a central portion 58 of spindle shaft 50. Stop member 54 extends outwardly, in a radial fashion, from mounting portion 56 of spindle shaft 50. Likewise, limit members 55 extend outwardly, in a radial fashion, from mounting portion 56 of spindle shaft 50, and are spaced from stop member 54 in direction 30.

Referring also to Fig. 2, lock mechanism 52 includes a housing 60. Housing 60 includes an outer side 60a, an inner side 60b, and a shaft opening 61. Shaft

opening 61 is configured with clearance notches 62 formed in housing 60 to facilitate the passing of stop member 54 of spindle assembly 20 through lock mechanism 52 as spindle shaft 50 is received in shaft opening 61 when lock mechanism 52 is being mounted to spindle shaft 50.

5 Referring to Fig. 3, a portion of housing 60 is retained between insert member 28 and limit members 55. In particular, insert member 28 engages outer side 60a of housing 60 and limit members 55 engage inner side 60b of housing 60, after final assembly. Accordingly, retaining ring 18 will be maintained in perimetrical groove 38 of insert member 28, between stop member 54 and outer side 60a of housing 60
10 after final assembly (see Figs. 1 and 3).

Stop member 54 includes a ramped surface 64 and a stop surface 66. As shown in Figs. 1 and 3, ramped surface 64 angularly extends outwardly, i.e., forms an incline, from an outer surface 68 of spindle shaft 50 and terminates at stop surface 66. If desired, ramped surface 64 may include an incline leading to a flat, which then
15 terminates at stop surface 66. Stop surface 66 extends outwardly from spindle shaft 50 in a direction, for example, substantially orthogonal to outer surface 68 of spindle shaft 50. Limit members 55 include a blunt face for engaging inner side 60b of housing 60 of lock mechanism 52. Stop member 54 and limit members 55 may be formed, for example, integral with spindle shaft 50 so as to form a unitary structure,
20 with stop member 54 and limit members 55 located at a desired orientation.

Spindle shaft 50 is mounted to insert member 28 by sliding mounting portion 56 of spindle shaft 50 in direction 49 into bore 36 of insert member 28, such as for example, with a pressing force. Stop member 54 of spindle assembly 20 is aligned with passage 42, which in turn receives stop member 54 as spindle shaft 50 is inserted
25 into bore 36 of insert member 28 in direction 49. During insertion, ramped surface 64 of stop member 54 engages retaining ring 18 to apply an interior force 46 to retaining ring 18. Retaining ring 18 reacts to the interior force 46 by expanding, thereby permitting spindle shaft 50 to be further inserted into bore 36 of insert member 28 in direction 49. Retaining ring 18 then returns to its pre-expansion state after ramped
30 surface 64 and stop surface 66 passes beyond retaining ring 18 as spindle shaft 50 is further inserted into bore 36 of insert member 28 in direction 49. Passage 42 limits the extent that spindle shaft 50 may be inserted in direction 49 into bore 36 of insert member 28.

Fig. 3 shows spindle assembly 20 mounted to liner body 14 via insert member 28, with stop member 54 having passed through retaining ring 18, and retaining ring 18 having returned to its pre-expansion state. Stop member 54 is configured with stop surface 66 facing a side surface 70 of retaining ring 18, such that if spindle shaft 50 is moved in a direction 30, which is opposite to the insertion direction 49, stop surface 66 engages side surface 70 of retaining ring 18 to resist removal of spindle shaft 50 from bore 36 of insert member 28. Accordingly, stop member 54 provides a positive stop to resist any attempt to move spindle shaft 50 in direction 30 after assembly.

While this invention has been described with respect to one embodiment, the invention can be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.